DOCUMENT RESUME

ED 088 836 SP 007 807

| | |
|---|---|
| AUTHOR | Keeler, Emmett B. |
| TITLE | Analysis of the Educational Personnel System: IV. Teacher Turnover. |
| INSTITUTION | Rand Corp., Santa Monica, Calif. |
| SPONS AGENCY | Department of Health, Education, and Welfare, Washington, D.C. |
| REPORT NO | R-1325-HEW |
| PUB DATE | Oct 73 |
| CONTRACT | OEC-0-71-2533(099) |
| NOTE | 63p. |
| AVAILABLE FROM | The Rand Corporation, 1700 Main Street, Santa Monica, California 90406 ($3.00) |
| EDRS PRICE | MF-$0.75 HC-$3.15 |
| DESCRIPTORS | Labor Turnover; *Teacher Employment; *Teacher Persistence; Teacher Retirement; *Teacher Supply and Demand; Teaching Experience |

ABSTRACT

This report attempts to predict the rates of teacher turnover in the 1970s, which teachers will leave the professicn, and what the effects of turnover will be on the educational personnel system. The overall termination rate has varied from six to 11 percent over the last 15 years. An analysis of recent changes in the teaching profession is used to modify collected results cn these past rates of turnover. The report recommends that administrators should not try to prevent the coming surplus of teachers but should be aware of it and exploit it. (Author)

ED 088836

# ANALYSIS OF THE EDUCATIONAL PERSONNEL SYSTEM: IV. TEACHER TURNOVER

PREPARED FOR THE DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

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R-1325-HEW
OCTOBER 1973

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## PREFACE

Under Contract OEC-0-71-2533(099) with the U.S. Office of Education, The Rand Corporation has been conducting an analysis of the educational personnel system in the United States. This is the fourth in a series of reports presenting details of Rand's research. The focus in this report is on current and future flows out of the teaching force. It should be of interest to both educational administrators and labor economists.

The other reports in this series are:

David Greenberg and John McCall, *Analysis of the Educational Personnel System: I. Teacher Mobility in San Diego*, R-1071-HEW, January 1973.

David Greenberg and John McCall, *Analysis of the Educational Personnel System: II. A Theory of Labor Mobility with Application to the Teacher Market*, R-1270-HEW, August 1973.

Stephen J. Carroll, *Analysis of the Educational Personnel System: III. The Demand for Educational Professionals*, R-1308-HEW, forthcoming.

Kenneth F. Ryder, Jr., and Stephen J. Carroll, *Analysis of the Educational Personnel System: V. The Supply of Elementary and Secondary Teachers*, R-1341-HEW, forthcoming.

Kenneth F. Ryder, Jr., *Analysis of the Educational Personnel System: VI. Staffing Patterns in U.S. Local Public Schools*, R-1342-HEW, forthcoming.

David Greenberg and John McCall, *Analysis of the Educational Personnel System: VII. Teacher Mobility in Michigan*, R-1343-HEW, forthcoming.

Stephen J. Carroll, David Greenberg, Emmett Keeler, John McCall, and Kenneth F. Ryder, Jr., *Analysis of the Educational Personnel System: VIII. Overview and Summary*, R-1344-HEW, forthcoming.

## SUMMARY

The baby boom of the 1950s has passed through the schools and we are no longer faced with the extreme teacher shortages of the past decade. The decision made by teachers at the end of each year--to continue or to leave--has taken on a new importance. Since the teacher force has stopped expanding, the number of teachers that leave determines the number that can be hired: All but 5 percent of new hires in the 1970s will be to replace terminating teachers. The teachers that continue remain the largest component in the supply of teachers.

This report, one of a series on the market for teachers, is a study of that decision. The purpose is to predict how many teachers will terminate, who they are, and what the effects of turnover will be on the educational personnel system. Such predictions will be important to educational policymakers as well as to students trying to decide on a career. It may also be important to those school children whose education is upset. (Appendix B shows that high turnover had a small but significant negative effect on reading scores in San Diego.)

The overall termination rate has varied from 6 to 11 percent over the last 15 years. A review of past studies of turnover, plus Rand work based on Social Security file data, shows that terminations (in contrast to transfers) have been far more influenced by such private reasons as children or old age than by job conditions or salary. In other words, terminations as a whole cannot really be controlled by educational administrators; predictions must be based on teacher demographics rather than on economic factors.

The standard predictive method in this field is simple trend analysis [1], but it is not valid here. There is substantial year-to-year variation in termination rates and no consistent trend, but even more important, estimates of future rates must be modified in light of the changes in the teaching profession. The most significant change is the tremendous expansion of the teaching force in the 1960s, followed by declining school enrollments in the 1970s. A concurrent change is the improved economic status of teachers. The political and organizational

strength of teacher groups may allow working teachers to retain their economic gains even in the face of a teacher surplus.

The results in this report indicate that termination rates will fall in the next few years because of the youth of the present teaching force and the attractiveness--and scarcity--of teaching jobs. But as the force ages, the rates should rise back to about 7-10 percent at the end of the decade. Since a sharp increase in terminations is unlikely, there will be a major surplus of would-be teachers in the 1970s. The market will obviously be different from that of the 1960s, but a surplus is not a catastrophe. The would-be teachers will have to settle for other jobs, but those public and private schools that have been unable in the past to attract an adequate staff will benefit. Almost all schools should have a good selection of candidates and should be able to hold them longer since better positions will not be available.

Although state and federal officials need not try to balance the market themselves, they should not exacerbate the problem. They no longer have to encourage the production of new teachers, or try to reduce overall rates of termination. They might encourage the imaginative use of would-be teachers in less expensive roles as part-time, private, or associate teachers. Although present rates of turnover bring a wholesome balance of fresh energy into the schools, some particularly unattractive schools have very high levels of turnover. It would be better to reduce turnover in these schools by improving conditions rather than by awarding hardship pay.

## ACKNOWLEDGMENTS

The author would like to thank John Despres, Larry Dougharty, and Vreni Keeler for helpful comments and suggestions, and Frank Berger and Fred Finnegan for their excellent technical assistance. Stephen Carroll, David Greenberg, and John McCall gave helpful advice and provided some of the appendixes.

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# I. INTRODUCTION

This report is one of a series of Rand analyzing the educational personnel system from an economic point of view. Our broad concern is the supply of and demand for teachers at various levels of the educational system. One reason for the study is the change in the teachers' market; the demand for teachers has now leveled off after the tremendous expansion of the 1960s.

A school or district has four basic manpower pools from which to recruit professionals. The largest is the supply of continuing teachers, but there are also new graduates, reentering teachers, and transfers. The demand for teachers is determined by the number of children to be taught, by the desired pupil-teacher ratio, and by school budget.[1]

This report is about the supply of continuing teachers--that is, those remaining in their jobs. The decision to stay or to leave determines the size of that supply. Because the interest here is in the teaching profession as a whole, rather than in the problems of individual schools, I concentrate on terminations rather than transfers and consider migrant teachers as remaining in the profession.[2]

Section II contains a review of several studies of past rates of teacher turnover. One such was based on questionnaires mailed in the late 1950s and early 1960s to various school districts and teachers. Next I present some original work based on the nationwide 1 percent sample of workers covered by Social Security. The longitudinal files of the sample enable tracing the work educational personnel were doing before and after they taught. Finally, I present some results from recent Rand analyses of data from San Diego and Michigan, which show that the past termination rate has varied from 6 to 11 percent over

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[1]The supply of new graduates and reentrant teachers are treated in [13], migrants in [11] and [14], and the demand for teachers in [12]. The overall model of the system and general recommendations are given in [15].

[2]Because many teachers who take leaves of absence do not return, they will be counted as terminations when they go on leave and reentering teachers when they return.

the last 15 years, but they yield no simple and reliable prediction of future trends. Estimates of future rates must account for expected changes in the teaching profession. In Section III, I discuss these changes, and in Section IV, I give some modified predictions.

Because a sharp increase in terminations is unlikely, there will be a major surplus of would-be teachers in the 1970s. In Section V, I discuss how educational administrators should react to that surplus. They need not try to balance the market themselves, because the losses for young would-be teachers are balanced by gains for less attractive schools. However, administrators should be aware of the changed market and not aggravate the situation.

## II. STUDIES OF PAST TEACHER TURNOVER

Future rates of teacher turnover are best considered in light of the rates in the recent past. The best studies of teacher terminations in the expanding teacher market of the last 15 years are [2, 3, 4, and 5], based on surveys conducted by the U.S. Office of Education and the National Education Association, and Rand work on the 1 percent sample of workers covered by Social Security in primary and secondary education. The problem with the OE and NEA studies is nonresponse. It is likely that the districts or teachers who did not respond to the questionnaires are systematically different from those who did. The problem with the Social Security file is coverage. As discussed in Appendix D, not all teachers are covered by Social Security, so that a teacher transferring to a noncovered school will be seen as terminating. Fortunately, the biases in both sets of results should not be too large, and as will be seen, the results are in reasonable agreement. Finally, the data from recent analyses of the San Diego and Michigan teachers are complete, and the only problem is in how closely national termination rates are approximated by the rates at these two places.

### THE QUESTIONNAIRE STUDIES

The Office of Education studies were based on a survey of a stratified sample of over 2000 school districts in 1957 and 1959. Table 1 gives the major results of the 1959 study by Lindenfeld, which was more detailed. The rate of termination (separations minus transfers) can be computed to be 8.1 percent. This figure has been used ever since in the NEA predictions of teacher supply and demand. Besides giving the gross rates, the studies also showed that the termination rate is not greatly related to such seemingly important economic factors as salaries or the pupil-teacher ratio. They noted that the rates of transfer in and out of districts were greater for small districts. Undoubtedly, the reason for this is that internal transfers are not so available in the smaller districts.

Table 1

TEACHING STAFF CHANGES IN PUBLIC ELEMENTARY AND SECONDARY SCHOOLS BY SEX, FALL 1959 TO FALL 1960 [2]

| | Teaching Staff Numbers | | | | | |
|---|---|---|---|---|---|---|
| | Total | Men | Women | Total | Men | Women |
| | (thousands) | | | (%) | | |
| Staff, Opening of Classes | | | | | | |
| Fall 1959 | 1,439.5 | 430.7 | 1,008.7 | 100.0 | 100.0 | 100.0 |
| Fall 1960 | 1,488.6 | 455.5 | 1,033.0 | | | |
| Staff Changes, Fall 1959 to Fall 1960 | | | | | | |
| Total accessions | 242.3 | 78.9 | 163.3 | 16.8 | 18.3 | 16.2 |
| Entering | 109.3 | 39.1 | 70.3 | 45.0[a] | 50.0[a] | 43.0[a] |
| Reentering | 55.8 | 12.8 | 43.0 | 23.0 | 16.0 | 26.0 |
| Transferring | 77.0 | 27.0 | 50.0 | 32.0 | 34.0 | 31.0 |
| Total separations | 193.2 | 54.2 | 139.0 | 13.4 | 12.6 | 13.8 |
| On leave of absence | 16.6 | 2.9 | 13.8 | 9.0[b] | 5.0[b] | 10.0[b] |
| Retired | 16.3 | 2.6 | 13.8 | 8.0 | 5.0 | 10.0 |
| Deceased | 3.1 | 1.1 | 2.1 | 2.0 | 2.0 | 2.0 |
| Dismissed | 24.4 | 10.5 | 13.9 | 13.0 | 19.0 | 10.0 |
| Changed to nonteaching job in same district | 6.0 | 3.6 | 2.4 | 3.0 | 7.0 | 2.0 |
| Transfers | 77.0 | 27.0 | 50.0 | 40.0 | 50.0 | 36.0 |
| Other separations | 49.6 | 6.6 | 43.0 | 26.0 | 14.0 | 31.0 |

[a]Percent of accessions.

[b]Percent of separations.

The NEA studies were based on questionnaires mailed to a stratified sample of about 2000 teachers. The response rate was quite good, over 90 percent. The teachers were asked why they decided to terminate. Economic reasons--better conditions, salary, or choice of advancement--accounted for 30 percent of *transfers*, but only 6 percent of *terminees* said they went into a better job. The rest cited such personal reasons as family responsibility or retirement. Table 2 summarizes the results from all these questionnaire studies. With the exception of 1957-1958, the rates are quite stable.

Table 2

NET LOSS TO THE PROFESSION--SEPARATIONS AND TRANSFERS
(percent)

| | 1955-56 [4] | 1957-58 [2] | 1959-60 [2] | 1964-65 [5] | 1965-66 [5] |
|---|---|---|---|---|---|
| Holdover | 85 | 79 | 84 | 81 | 85 |
| Accessions | 15 | 21 | 16 | 19 | 15 |
| Enter and reenter | 9 | 16 | 11 | 12 | 9 |
| Transfers | 6 | 6 | 5 | 7 | 6 |
| Terminations | 7 | 11.2 | 8.1 | 9 | 7 |

SOCIAL SECURITY SUBFILE RESULTS ON TERMINATIONS

The Rand primary and secondary education subfile is a 1 percent sample of the covered wage earners in the primary and secondary education field for the years 1962-1966. It is described in detail in Appendix D. The Social Security file has extensive information on salary and work before and after teaching, and we hoped to use it to test the relative importance in terminations of economic factors rather than such personal factors as age and sex. There are several problems in using it to investigate turnover. The actual work performed is not reported, only that the employer was in primary and secondary education. Full-time teachers must be selected from other educational workers--janitors, secretaries, nurses or administrators--by means of salary. A teacher was defined to be anyone who made more than $600 per quarter

in primary or secondary education for two consecutive quarters. Unfortunately, some part-time teachers and other school staff will be included, and a few low-paid full-time teachers will be excluded.

Another problem, discussed at length in Appendix D, is found in states that do not have complete Social Security coverage of teachers. A person who leaves a covered for an uncovered teaching position will be recorded as a terminee. This does not seem to be too serious, since most moves are made within states, and an overwhelming majority of teachers nationwide are covered.[1]

Finally, persons were said to be teaching in a particular year if they made more than $X in primary and secondary education in the first quarter.[2] They were called terminees if they made less than $300 in education in the first quarter of the next year.

Table 3 shows the importance of demographic factors on terminations. The termination rates are quite stable through these years, with old people and young women the most likely to terminate. The NEA results, indicating personal reasons as the major cause for leaving the profession, are confirmed. The questionnaire rates are generally lower than those given in the cross tabulations. The tabulated rates are slight overestimates because of the coverage problem and because included subprofessionals will probably have larger termination rates than teachers.[3] In addition, the Social Security "terminators" include teachers taking leaves of absence. These make up about 30 percent of teachers who stop working. With these two adjustments, the Social Security estimates of termination rates are from 7 to 8 percent.

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[1] In 1967, [7] reports that 1.5 percent of the teachers moved to another state. Since over 80 percent of the teachers are covered, less than .3 percent of the teachers who still teach should disappear from the Social Security records.

[2] The minimum cutoff point was derived from 10th percentile salary of young, full-time workers. The actual formula was X = 700 + 50 · (year minus 1962) + 100 (if not in South) + 100 (if West or North Atlantic).

[3] In addition to the approximately one-half percent of teachers transferring to uncovered employment, there may be problems with changed Social Security numbers. In unpublished recent work, I estimated that one-half percent of teachers' numbers may be changed or misrecorded. Therefore, the total over estimate of Table 3 may be about 1 percent.

Table 3

TEACHERS WHO TERMINATED, BY DATE OF BIRTH AND SEX, 1963-1966
(percent)

| Date of Birth | 1963 | | 1964 | | 1965 | | 1966 | |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female | Male | Female |
| Before 1901 | 16 | 19 | 21 | 21 | 24 | 24 | 23 | 20 |
| 1902-14 | 5 | 4 | 7 | 5 | 5 | 6 | 4 | 6 |
| 1915-24 | 3 | 5 | 8 | 5 | 7 | 5 | 5 | 6 |
| 1925-34 | 4 | 17 | 7 | 12 | 8 | 9 | 8 | 9 |
| After 1935 | 12 | 22 | 12 | 26 | 13 | 22 | 12 | 21 |
| Total Percent by Sex | 6 | 11 | 9 | 12 | 9 | 11 | 8 | 11 |

So far, this is just the conventional wisdom--teachers quit because they are too old, or because they get married and have children. I next used regression techniques to see if any other information on the Social Security file could help to predict terminees. Such techniques weigh the importance of different possible causes. The variable to explain is the decision to terminate, signified by a 1 if they terminate, and 0 otherwise. The explanatory variables included all those I thought might be important and for which the file contained data: age, a dummy for over 61; youth, a linear function that sloped down to zero at age 39; fertility, the probability of a woman of a given age bearing children based on data in the yearly population surveys;[1] race; sex; size of school district; the logarithm of salary; and experience, a dummy that was one if the teacher was not a new hire. Preliminary testing showed that two other explanatory variables--the region of the country and whether the teacher was teaching three years ago--were insignificant, so they were left out of the final estimates. The final model is:

[1]Since Social Security data do not record marital status or when children are born, all women of a given age must be given the same probability.

$$\text{Termination} = \alpha_0 + \alpha_1 \cdot \text{Age} + \alpha_2 \cdot \text{Youth} + \alpha_3 \cdot \text{Fertility} + \alpha_4 \cdot \text{Race}$$
$$+ \alpha_5 \cdot \text{Sex} + \alpha_6 \cdot \text{District Size} + \alpha_7 \cdot \text{Log Salary}$$
$$+ \alpha_8 \cdot \text{Experience}.$$

For the years 1963-1966, the decision to terminate was regressed against the eight variables discussed above. Four of the variables were consistently important--fertility, age, youth, and salary. Race, sex, the size of the school district, and whether the terminee was a new hire added very little to the explanatory power of the model. The salary variable was significant, but the effect on rates of termination was small; people with 15 percent higher salaries have rates of termination 1 percent lower when the other factors are controlled for.

Table 4 shows the regression results. The multiple correlation coefficient, R, is low even with all eight explanatory variables included because the regression is on individual actions and the termination rate is low even for the most termination-prone groups.

Table 4

MULTIPLE REGRESSION ON RATES OF TERMINATION

| Year | Termination Rate | Age $\alpha_1$ | Youth $\alpha_2$ | Fertility $\alpha_3$ | Log Salary $\alpha_7$ | R |
|---|---|---|---|---|---|---|
| 1963 | 8.9 | .18 (.02)[a] | .031 (.015) | .72 (.13) | -0.55 (.021) | .26 |
| 1964 | 10.3 | .15 (.02) | .056 (.016) | .56 (.15) | - .05 (.02) | .24 |
| 1965 | 9.7 | .15 (.02) | .055 (.015) | .32 (.14) | - .08 (.02) | .21 |
| 1966 | 9.2 | .14 (.02) | .052 (.015) | .5 (.15) | - .02 (.02) | .21 |

[a]Standard errors are in parentheses.

The two most important variables are age and fertility. Teachers are divided into the termination-prone groups--old people and young women--20 percent of whom leave; and others, five percent of whom leave. Such information can be used to predict how much effect retraining different groups of teachers will have on schools, and also what effects changes in teacher demography will have on the total rates of termination.

## WHAT DO PEOPLE WHO LEAVE TEACHING DO NEXT?

The Social Security file disclosed the next year's occupations of the people who left teaching during the period 1962-1965. Table 5 shows their occupations and Table 6 shows the changes in their salaries. Most terminees did not work in the next year, suggesting again that higher pay in teaching relative to other jobs will not have much effect on termination rates. Of the people who left teaching, especially the women, most did so for noneconomic reasons.[1]

These tables show that men are more likely to stay employed than women and are more able to find higher paying jobs. Very few women found substantially better paying jobs. Differences by sex seem more important than differences by race, but blacks are somewhat more likely to stay employed. When the terminees were divided into age groups, young men were more likely to go into the manufacturing and service industries, middle-aged men and all women generally remained in professional jobs, and old men and women rarely took another job.[2]

## RECENT TURNOVER RESULTS

A recent analysis of data on San Diego schools [11] confirms that personal characteristics of the teacher, rather than economic conditions, are the best predictors of terminations. The data included measures of the presumed attractiveness of schools to teachers: the percent of

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[1]The present tighter market for teachers makes terminating less attractive for teachers who cannot get a leave of absence. At the time of these data, such teachers could freely reenter.

[2]The unemployment dates, especially for men, may seem high, but they include people going back to school or taking an uncovered job.

Table 5

WHAT DO PEOPLE WHO LEAVE TEACHING DO THE NEXT YEAR
(percent)

| | No Job | Manufac-turing | Ser-vice | Other Profes-sional | Educa-tional | Govern-ment | Total Number in Sample Who Left Teaching |
|---|---|---|---|---|---|---|---|
| Black male | 43.7 | 9.7 | 17.5 | 10.7 | 9.7 | 8.7 | 103 |
| Black female | 73.0 | 1.0 | 4.0 | 7.1 | 4.0 | 10.7 | 196 |
| White male | 53.6 | 9.6 | 13.8 | 5.9 | 9.6 | 7.5 | 239 |
| White female | 85.5 | 1.4 | 1.9 | 2.6 | 3.0 | 5.6 | 427 |

Table 6

SALARY DIFFERENTIAL FROM PREVIOUS YEAR'S TEACHING JOB
(percent)

| | No Job | Lost more than $800 | -$800 + $800 | Gained more than $800 |
|---|---|---|---|---|
| Black male | 43.7 | 31.0 | 10.7 | 14.6 |
| Black female | 73.0 | 16.8 | 6.1 | 4.1 |
| White male | 53.6 | 20.6 | 10.9 | 14.8 |
| White female | 85.5 | 8.0 | 4.8 | 1.6 |

families on welfare, reading scores, and a subjective ranking of ease of administration given by a panel of superintendents. Only at the senior high school level did attractiveness have any observable effect on terminations, although most transfers were from unattractive to attractive schools. San Diego is in some ways ahead of its time in that after massive growth in the 1960s enrollments had already started to fall in 1970, the year under study. Its teacher force is younger than average.

The San Diego data also included teacher-supplied reasons for termination. Table 7 shows these reasons, together with the results from

Table 7

DISTRIBUTION OF TERMINATING TEACHERS BY REASON

| | San Diego 1970[a] | United States 1967[b] | United States 1966[c] (Planned) | United States 1971[c] (Planned) | United States 1962-[d] 1965 |
|---|---|---|---|---|---|
| Rate of termination | 4.9 | 4.2-7.5 | 8.8 | 10.5 | 10 |
| Reason for termination | | | | | |
| Retirement | 33 | 29 | 17 | 21 | 20 |
| Children and homemaking | 27 | 21 | 33 | 30 | - |
| Return to school | 8 | 15 | 19 | 13 | - |
| Job outside education | 8 | 16 | 17 | 20 | 12 |
| Promotion | 4 | - | - | - | - |
| Dismissal | 3 | - | 5 | 3 | - |
| Death, illness | 7 | 11 | - | - | - |
| Other | 10 | 8 | 9 | 13 | - |
| Leave of absence | 1.4 | 2.0 | Included | Included | Included |

[a][11, p. 42]. Data have been adjusted to account for the 8 percent of terminees from San Diego who transferred to another district. The 27 percent who said that they moved or husband moved were assumed to divide as follows: 10 percent transferred to another teaching job, 5 percent went to children and homemaking, 2 percent retired, 1 percent returned to school, 2 percent went to jobs outside education, 7 percent were out for just one year (a kind of leave of absence).

[b][7]. Another 3.3 percent were separated, location not known. Most of these probably terminated and moved. Promoted teachers were considered to be holdovers.

[c][8]. These figures include leaves of absence. Since these are plans, there is no death or illness. Promoted teachers are counted as holdovers.

[d]My own unpublished work on the Rand Social Security file of workers.

some NEA surveys. There is good agreement and stability in the answers, particularly since most of leaves of absence are taken by women to have and to raise children. The San Diego data had a category "husband moved," which the others did not, and which was quite important in this Navy-oriented town. As the market gets tighter, many women who would like to transfer will be simply unable to find a teaching job in their new location.

Unpublished work on the Michigan schools shows that 30 percent of the people teaching in 1968 terminated before 1971. This four-year rate is equivalent to a one-year rate of about 10 percent, because experienced teachers are less likely to quit.

A multiple regression of the Michigan terminations on school and teacher characteristics showed that personal characteristics--female under 30, and male or female over 53--were most important; but coming from out of state, and a decline in SES of students and reading scores also raised terminations significantly. A higher salary and a master's degree had a small but significant effect in reducing terminations. The school's level, location, and absolute level of SES or reading scores were not significant.

## III. CHANGES IN THE TEACHING PROFESSION

The estimates of teacher termination from the past 15 years must be modified for future prediction in the light of major changes that have occurred in the teaching profession. In fact, these changes will have a great effect on most aspects of the educational personnel system in the 1970s.

The rapid expansion of the teaching force in the 1960s, caused by the preceding baby boom, brought in many new teachers who made the profession younger on average and more professional. Economic status and teaching conditions have improved because of the high demand for teachers, continued urbanization, consolidation of smaller schools, and the emergence of professional teachers' organizations as a powerful force.[1] These two factors combined to push education's share of GNP from 4-1/2 percent in 1960 to 6-1/2 in 1970. But the baby boom ended, declining enrollments quickly transformed the shortage of teachers into a surplus, and that trend will continue through the 1970s.

### TEACHER DEMOGRAPHY

Throughout the 1960s, the schools continued to feel the effect of the baby boom of the 1950s. Although 1961 was the peak year for births, the effect on the schools was naturally delayed--the peak elementary enrollment was in 1969, and peak secondary enrollment will probably occur in 1973. Education received additional emphasis through Sputnik (a large factor in the National Defense and Education Act of 1958) and the War on Poverty, which relied heavily on educational programs such as the Elementary and Secondary Education Act of 1965.

Table 8 shows the growth of the elementary and secondary instructional staff over the last 15 years. The average annual gain was over 4 percent with the bulk consisting of recent graduates of liberal arts or teaching programs. As shown in Table 9, teachers today are younger and less experienced but better educated than they were ten years ago.

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[1] Many details of the changes can be found in [6].

Table 8

NUMBERS AND SALARIES OF INSTRUCTIONAL STAFF

| School Year | Staff (thousands)[a] | Percent Gain Over Previous Year | Average School Year Salary (current $)[b] | Average School Year Salary (constant 1959 $) |
|---|---|---|---|---|
| 1957-58 | 1,356 | -- | 4,720 | 4,862 |
| 1962-63 | 1,651 | -- | 5,921 | 5,743 |
| 1963-64 | 1,717 | 4.0 | 6,240 | 5,928 |
| 1964-65 | 1,797 | 4.7 | 6,465 | 6,142 |
| 1965-66 | 1,884 | 4.9 | 6,935 | 6,380 |
| 1966-67 | 1,980 | 5.1 | 7,129 | 6,345 |
| 1967-68 | 2,071 | 4.6 | 7,630 | 6,630 |
| 1968-69 | 2,159 | 4.2 | 8,272 | 6,783 |
| 1969-70 | 2,253 | 4.4 | 9,047 | 7,057 |
| 1970-71 | 2,297 | 1.9 | 9,698 | 7,166 |
| 1971-72 | 2,332 | 1.5 | 10,213 | 7,348 |
| 1972-73 | 2,350 | 0.8 | 10,643 | 7,340 |

[a] NEA research estimates.

[b] [16]. Instructional staff includes teachers, supervisors, principals, librarians, counselors, and related instructional workers.

Table 9

PUBLIC SCHOOL TEACHERS' EDUCATION, EXPERIENCE, AND AGE [6]
(percent)

| | 1961 | 1966 | 1971 |
|---|---|---|---|
| Highest Degree Held | | | |
| Less than bachelor's degree | 14.6 | 7.0 | 2.9 |
| Bachelor's degree | 61.9 | 69.6 | 69.6 |
| Master's degree or six years of schooling | 23.1 | 23.2 | 27.1 |
| Doctor's degree | 0.4 | 0.1 | 0.4 |
| Median Years of Experience | | | |
| Total years of experience | | | |
| All teachers | 11.0 | 8.0 | 8.0 |
| Men | 7.1 | 6.5 | 8.0 |
| Women | 14.2 | 10.0 | 8.0 |
| Median Age | | | |
| All teachers | 40.0 | 36.0 | 35.0 |
| Men | 33.6 | 33.0 | 33.0 |
| Women | 45.5 | 40.0 | 37.0 |

The other major trend noticeable in Table 9 is a blurring of the distinction between the career experiences of men and women, reflecting the increasing propensity of married women to work and the retirement of many women who had devoted their lives to teaching.

The number of teachers employed in the public schools is (by definition) the product of the number of students of school age, their rate of enrollment, and the ratio of instructional staff to students. Because of the lag between birth and school attendance, we already know the numbers of potential school children for the rest of the 1970s. Enrollment rates for children 6-15 are already 99 percent, so further expansion can come only from those 16-19 (about 80 percent enrolled) or preschoolers. Five-year-olds already have about an 80 percent enrollment rate, but a large one-shot addition to school enrollments could come if school age were extended down to three- or four-year-olds on a widespread basis.[1] Barring this, school enrollments will decline slowly over the rest of the decade in the elementary and secondary schools.[2] The number of pupils per staff member fell from 24 to 20 in the decade. Part of the decrease is due to the ESEA, which provided funds for about 100,000 extra teachers of disadvantaged students; part is due to the aging of school populations (secondary schools have a lower pupil-staff ratio than do elementary); and about half reflects an effort at all levels to improve schools by lowering the ratio.

## TEACHER SALARIES AND ORGANIZATION

The shortage of teachers combined with the high expectations for education contributed to a large increase in teacher salaries in the 1960s. Teachers' real purchasing power increased over 30 percent, and by 1971 the mean family income of married teachers was over $17,000.[3]

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[1] Nonpublic schools are a possible source of more students (10 percent of total pupil enrollment) but they would also provide teachers.

[2] At the same time the oldest postwar babies are now in their mid-20s and are flooding the labor markets.

[3] [6]. As shown in Appendix C, teachers, especially male teachers, pick up extra money in summer jobs and in second jobs such as coaching or bus driving in the school year.

Table 8 showed the increase both in money and in constant value terms. With teacher shortages becoming less acute, the rate of salary increases has slowed, despite the growing adoption of collective bargaining between teacher organizations and school districts. The main reason for the increase was the shortage of teachers caused by increased enrollments, but a higher regard for education and the increased educational qualifications of the teaching force were also important.

Two other long-term factors also acted to increase salaries and professionalism of teachers, the continued urbanization of the national population and the consolidation of small rural schools. Table 10 shows the dramatic fall in the number of elementary schools, especially one-teacher schools. It also shows how the suburbs have increased their share of national population at the expense of poorer rural areas and towns.[1] The poorest paid, most isolated sector of the teaching force has been shrinking, and the best paid and most professional sector has been dramatically increasing.[2]

Table 10

URBANIZATION AND CONSOLIDATION OF RURAL SCHOOLS

| | 1950 | 1960 | 1970 |
|---|---|---|---|
| Number of elementary schools (thousands) | 128 | 92 | 67 |
| Elementary schools with one teacher (thousands) | 60 | 20 | 2 |
| Central city (percent of national population) | 32 | 32 | 32 |
| Suburbs (percent of national population) | 14 | 21 | 27 |
| Towns (percent of national population) | 18 | 16 | 15 |
| Rural (percent of national population) | 36 | 30 | 26 |

[1] Growth states such as Arizona, Florida, and California have much higher salaries than declining states like Arkansas, the Dakotas, and West Virginia.

[2] Some of the difference between urban and rural salaries is related to living costs that are at least 10 percent higher in the city, but most of the difference represents a real gain by the urban teacher. In 1960, districts with 1-49 teachers had mean salaries of $4707. Districts with 2500+ teachers had mean salaries of $6400.

Will school budgets continue to rise in the face of declining enrollments and dissatisfaction with high local taxes, and will school administrators spend their money on a relatively small number of highly paid teachers or on a larger number of less well paid teachers? Although jobs are highly sought after in many places and salary increases have recently slowed, school budgets will likely continue to expand, and the increased revenues will go to higher salaries for those people who have teaching jobs instead of into hiring more would-be teachers who do not have jobs.

Table 11 shows that the level of the government's share of school support has changed very little since the passage of the Elementary and Secondary Education Act of 1965. In the decade covered by that table, education expenditures climbed from 4-1/2 to 6-1/2 percent of gross national product. This increase has recently put a number of school systems under severe financial pressure. However, revenue sharing has relieved many state financial crises and may eventually reduce the schools' reliance on the property tax as a means of financing. The substitution of a less direct method of financing should make citizens more amenable to rises in expenditures on education. Although recent court decisions have indicated that absolute equality of school financing is not a constitutional right, *Serrano* and other decisions should lead to some equalization of school expenditures between richer and poorer districts. Most likely this equalization will come because the poorer districts increase their expenditures rather than because the richer districts decrease theirs. These decisions will probably also increase the state share of school financing, which again should make higher expenditures more likely. Finally, teachers' organizations have begun to take a more direct interest in school board elections. Their numbers and concentrated wants should make them very influential at the local level.[1]

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[1]Other municipal employees have done well, but teachers have several particular advantages. They constitute more than half of state and local employees. A mayor or city councillor must appeal to a variety of local interest groups, but the school board will generally face only one organized group, the teachers. However, a teachers' strike is probably not as devastating as a police or firemen's strike.

Table 11

PERCENT OF REVENUE RECEIVED FROM FEDERAL, STATE, AND LOCAL SOURCES FOR PUBLIC ELEMENTARY AND SECONDARY SCHOOLS [8]

| Years | Federal | State | Local |
|---|---|---|---|
| 1961-62 | 4.3 | 38.7 | 56.9 |
| 1963-64 | 4.4 | 39.3 | 56.4 |
| 1965-66 | 7.9 | 39.1 | 53.0 |
| 1967-68 | 8.8 | 38.5 | 52.3 |
| 1969-70 | 7.2 | 40.9 | 51.8 |
| 1971-72 | 7.1 | 40.9 | 52.0 |

If teachers are able to place their candidates on the local school boards, salary schedules as a whole will continue to rise, perhaps more slowly than in the past decade. Furthermore, because of the form of the salary schedules now in effect, teachers' salaries will automatically rise a great deal, as today's teachers hold on to their jobs and the whole teaching force ages. The 1965 NEA book *Profiles of Excellence* has a number of recommendations about salary schedules that the organization has successfully persuaded many school districts to adopt.[1] Suppose that in the next few years schools with this type of salary schedule have declining enrollments and do no hiring. In five years, teachers will average about 2-1/2 annual experience increments

[1] *Profiles in Excellence* says the superior school has a written salary schedule, which is reviewed annually and revised with the consultative resources of county, state, and national organizations called upon as needed. No distinction is made in the schedule among staff members on the basis of grade level, subject taught, or teacher performance. The maximum salary attainable for a master's degree or five years of preparation is at least 100 percent above the bachelor's degree minimum. The schedule recongnizes the bachelor's degree, master's degree, sixth year of schooling, seventh year, and earned doctorate. Differentials for each additional year's preparation are at least 10 percent of the bachelor's degree base at minimum and 20 percent at maximum. The amount of annual increments in each preparation level averages at least 8 percent of the bachelor's degree minimum. The schedule contains 10 to 12 annual increments at the master's degree or sixth-year level, exclusive of long service increments.

(currently eight years of experience is the median, so much of the staff will already be at the maximum level). Suppose also that each teacher improves his education by one year. Then, relative to the bachelor's minimum, the whole force will gain an average of 2-1/2 x 8 percent for experience and 20 percent for education, a total of 40 percent of the bachelor's degree minimum. Based on 1971 estimates of mean salary and mean bachelor's degree minimum, this gain represents a 30 percent increase in teacher's salaries, and a 15 percent increase in total expenditures on education.[1] This is not inflation but merely marks the aging of the teaching force back to a normal level. The effects of a hiring freeze will be to increase expenditures on teachers' salaries anyway. However, unless the base salary rises as well, the increase could be largely offset by continuing inflation.

Performance contracting and voucher experiments have been suggested and experimented with as methods to hold down costs and increase the responsiveness of the public schools. Since teachers are the most expensive part of the school budget, such methods tend to rely on the substitution of less expensive resources--equipment or teacher's aides--for teachers. Also, with a surplus of teachers, private contractors will probably be able to pay less for the teachers they employ. Teacher organizations have welcomed volunteer aides, or even paid aides if they are added to current staffing patterns, but they have strongly resisted substitution of aides for teachers. Even so, use of aides has greatly increased in the past few years, and the issue will be a major test for teacher organizations in the 1970s.

The increased numbers of blacks and men entering teaching will probably not have much effect on overall instructional expenditures. Although blacks' salaries have historically lagged behind whites', and women's salaries behind men's, the causes of the differentials will be weakened for new teachers. The main reason blacks have lagged behind whites has been their concentration in poor rural southern school

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[1] In [8], the mean bachelor's minimum salary is given as $7,061. In [6] the mean contract salary is given as $9,260. In [1], the instructional staff's share of current expenditures is given as 62 percent, and of total expenditures as 50 percent.

districts. Over the last decade, salaries in these districts have been catching up, and the richer urban districts have been hiring blacks. Men continue to earn more than women, but most of this differential relates to outside jobs and does not affect school expenditures. Appendix C is a detailed analysis of teacher income differentials in the 1960 Census.

In summary, institutional and political forces pushing salaries higher will overcome the downward pull of the teacher surplus. Although the salary rise may not be as fast as in the 1960s, teachers should at least be able to hold their own.

For a number of reasons, teachers will retire younger. First, teacher militancy and political interest should result in improved pensions, starting earlier. Better pensions are often a successful compromise in struggles between local governments and municipal employees' unions. The city cannot use current financial pressures as an excuse to reject pensions. The benefits of pensions are real to the teachers, but current officials escape blame because the costs are deferred. Second, as old people become more numerous and politically important, the trend of revising Social Security regulations to permit earlier retirement should continue.[1] In San Diego in 1970, almost half of the retiring teachers were under 62. Such relatively young retirees will become more and more typical as time goes by.

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[1]Since 1965, Social Security benefits paid to people who retired before age 65 have increased from 30 to almost 50 percent.

## IV. PREDICTIONS

Falling school enrollments and the likelihood of continuing high salaries will mean that the rates of new hires will be low in the 1970s. Teaching will remain an attractive occupation, and a teaching job will be a choice good. The work is meaningful, pay is fairly good, and vacations are long. The studies of termination show that personal rather than economic reasons motivate most terminees. Table 12 lists the most important reasons with their approximate mid-60s proportions of terminations.[1]

Although I have argued that the age for retirement should be lower in the future, the teaching force now has a median age of only 35. As the flow of new people dries up the force will age, so the drop in retirements will be only temporary and retirements in the late 1970s and 1980s should be quite high. If the number of children desired by women continues to drop, and teaching remains attractive, fewer and fewer teachers will choose to be full-time housewives for very long.

Table 12

TERMINATION TRENDS BY CAUSE

| Cause of Termination | Proportion (percent) | Predicted Trend |
|---|---|---|
| Retirement, death, illness | 30 | lower, but higher in late 70s |
| Children or other home responsibilities | 25 | lower |
| Other personal reasons: | | |
| School, travel, rest | 15 | same |
| Moved or husband moved | 10 | higher |
| Nonteaching job in education | 10 | same |
| Job outside of education | 10 | higher |

[1] Estimates derived from Social Security files, [5], and [7].

This is part of a long-term trend toward more working wives.[1] If such social services as day care centers become widespread, it will reduce housewife terminations even more. The question of mobility is mixed: More people move each year, but it may be in part because of the youth of the national population. As teachers' jobs become scarcer, a family will have to think twice before a wife gives up a well-paying teaching job to follow her husband to a slightly better job. Although fewer teachers may be moving, the proportion of terminations due to moving will rise, because those teachers who do move will be much less successful in finding a new job.

In the category of other personal reasons, too, the tightness of the teacher market should balance or even override national tendencies for more nonworking adult years. The number of teachers getting jobs outside of education will rise, since people who would previously have transferred--because of moving or dissatisfaction with their current school--will no longer be able to find new teaching jobs. Also as more opportunities for women develop outside of teaching, women teachers will take advantage of them.

In sum, the overall rates of termination will fall because of the attractiveness of teaching jobs, the perceived difficulty of regaining a lost job, and the youth of the present force. In the 1960s the termination rates varied from about 7 to 10 percent. The effect of the factors listed here should be lowered rates to about 5 to 8 percent in the next few years, rising to 7 to 10 percent by 1980.

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[1] According to [23], the number of working wives rose from 30 percent in 1960 to 40 percent in 1970.

## V. CONCLUSIONS

Evidence from several outside studies and Rand research have been combined in an investigation of teacher terminations--in particular, how many teachers will terminate, which groups are especially prone to do so, and what reasons they have. The agreement among various studies is not perfect but is close enough to permit drawing a few conclusions with confidence.

- The major reasons for termination concern the private lives of teachers rather than job conditions or salaries making terminations difficult to control.
- The rates have fluctuated from 6 to 10 percent in the 1960s. This is a large variation and no trend is apparent.
- It is most unlikely there will be sharp increases in terminations during the 1970s. Because of the number of young people entering the teacher market, falling school enrollments, and protective arrangements of working teachers, there will very likely be a large surplus of would-be teachers.

The surplus of teachers causes a completely different situation from the extreme shortages that prevailed in the early 1960s, and state and federal officials should be aware of the new situation. Although they do not have to balance the market themselves, they should not aggravate the imbalance. They no longer have to encourage the production of new teachers nor should they try to reduce the rates of termination. It will be more efficient to retrain those currently teaching than to train new college students.

One possibility with a surplus market is to try to influence which groups remain in and which leave the teaching profession. Although terminations occur among specific groups of people--young mothers and older teachers--for reasons beyond administrative control, programs could nevertheless be tailored to these groups. Day-care centers might

reduce the terminations of young mothers, for example. And early retirement plans, part-time teaching, or referral of older teachers to less physically demanding jobs might increase their flow out of the profession, thus keeping the age of the teaching force more balanced than it would normally be with a low rate of turnover.

Salary changes are not a practical means of controlling the rate of turnover. Because of the organizational strength of teachers, wages cannot be adjusted sharply downward, and rising wages would not reduce terminations very much.[1] In any case, financial constraints may make it difficult to increase the number of full-time, full-paid teachers much. However, many people might want to work for less of the day, or for less pay. Jobs as part-time teachers or teacher's aides might be attractive for them, and they could be more effective than full-time teachers since they would not be as tired.

In fact, the picture is not as bleak as it might at first seem. The surplus teachers will get jobs in different fields: Last year unemployment was very low among new graduates with education majors.[2] Although these people might well have been teaching if they had graduated ten years ago, two years later a third of them would have quit or been dismissed. (This is not to ignore their frustration; it is easy to find young people today who really want to teach and are not getting the chance.)

The market for teachers is in fact two-sided: The difficulties that would-be teachers experience in getting jobs are balanced by the benefits to those schools, public and private, that have been unable in the past to attract an adequate staff. In the future, almost all local school administrators will have a good selection of candidates and should be able to hold on to them longer.

It is neither practical nor essential to use terminations as a major instrument of educational personnel policy. One cannot determine who the good teachers are by looking at their group characteristics,

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[1] The regression coefficient for salary in 1963 shows that it would take a 15 percent rise in salary to effect only a 1 percent decline in the termination rate.

[2] Conversation with W. Dorfman, National Center for Educational Statistics.

and one cannot find a systematic way of inducing bad teachers to quit and good teachers to stay. In addition, termination becomes a major problem only when the rates are so high that continuity is lost and schools are chaotic as happens at "unattractive" slum schools in big city districts, which serve as the port of entry into the system.[1] Since teachers within the system generally get precedence over outsiders for jobs at desirable schools, in many districts new teachers are hired to work in the problem schools, and as soon as they can they transfer to more congenial schools. The problem is not the overall rate of termination but rather the insufficiently compensated burden of teaching in such schools. Although "hardship" pay might end the teacher termination problem, the alternative approach of improving the general conditions at such schools would be fairer to the students, who presumably would not be eligible for hardship pay. In sum, the present rates of termination provide for a reasonable infusion of new energy, without causing chaos. Although it may be interesting to know future rates of termination exactly, for any practical purpose it is enough to know that they will barely begin to absorb the impending surplus of teachers.[2] Educational administrators should be aware of the surplus, as it makes many formerly useful attitudes obsolete; however, they should not try to balance the market themselves.

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[1] Appendix B documents the small but significant negative effect that turnover has on reading scores in such schools.

[2] Other factors affecting teaching manpower, such as the future of parochial schools and the ages of school attendance, will be much more important than the rate of turnover. Appendix A contains a list of such factors.

## Appendix A

## FACTORS THAT MIGHT AFFECT TEACHER MANPOWER TRENDS

The economic laws of supply and demand, coupled with young people's desire to work, make extreme teacher supluses unlikely. If people can find no jobs in teaching, they will have to prepare for and accept different types of work. Other factors could also alter past rates and trends used in teacher manpower projections. Many of these factors are considered in greater detail in other reports in this series. At the least, they show the variety of forces that go into this large market and the fragility of trend analysis as a predictive tool.

### High School Graduates Going to College

o More aspirations and money among lower class. (Lower class people may have different career patterns than middle class people--e.g., they are less likely to stop teaching when they get married.)

o Changing perception of the value of a degree. (This can go both ways. For many jobs, certification is becoming more necessary, but technological unemployment and a strong decertification movement could reduce the perceived value of going to school, or of certain majors.)

o Counterculture (other escapes from home are now possible).

o Draft, GI Bill (their termination will reduce the number of people in college, but only the one-fourth of new teachers who are men).

### College Graduates Becoming Teachers and Staying Teachers

o School conditions: salaries and amount of work expected; teacher independence, specialization, individualized instruction; centralization or community control, desegregation.

o Fertility rates, marriage and divorce trends, women working, day care, part-time jobs.

o Relative ease of getting jobs: state of the rest of the economy vs. teacher surplus or shortage. In a tight market, fewer people try to become teachers and fewer people quit. A teaching certificate is no longer "insurance."

o Social status and roles expected of teachers. (Are teachers respected? Is their private life restricted?)

Teacher Firings

o Upgrade quality (or "quality" as measured by advanced degrees).

o Collective bargaining, strikes, and reprisals (the distinction between tenure and nontenure may be erased, flexibility in hiring special categories of teachers may continue to be difficult).

o Attacks on tenure.

Demand for Teachers

o Changes in education's share of government money. (This could rise through the growth of teachers as a political force, the *Serrano* decision, or money given to ghetto schools as a palliative for continued segregation. It could fall by the unpopularity of schools and property taxes, or by the growth of private schools.)

o Fertility rates.

o New methods (teacher's aides, technology, and voucher and other experiments may lead to radical changes in student-teacher ratios).

o Changes in age of school attendance (nursery school, day care, earlier or later end of mandatory attendance, end of any mandatory attendance).

o Decline or collapse of parochial schools.

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## Appendix B

## A NOTE ON THE EFFECTIVENESS OF TEACHER EXPERIENCE[1]

### INTRODUCTION

Recent studies have found a significant relationship between student achievement and teacher experience.[2] That is, schools with high achieving students tend to have a more experienced teaching staff. One view of this relationship is that more experienced teachers raise student achievement by better teaching. That is, in fact, a major rationale for salary increases based on teacher experience. However, causality may run the other way. The average reading ability of a school may determine a faculty's average level of experience: Teachers move to schools attended by superior test takers, and once there they seldom return to a poorer school.[3] From this point of view, teacher experience levels are actually the result of teacher turnover--that is, of teacher departures from the less attractive schools. This appendix studies such departures in an attempt to discriminate between these two reasons for the relationship between experience and reading scores.

It could be argued that teacher departures cause students to have reduced reading ability. Any school that exports a large number of teachers will generally get young and inexperienced teachers as replacements. Such teachers may not do a good job of teaching until they accumulate some experience. Teacher turnover during the school year should be exceptionally detrimental to students.

On the other hand, reading ability and factors related to it such as the race and class of students may cause or influence teacher departures. In general, white middle-class schools, where students possess high reading ability, are more attractive to most teachers.[4] The

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[1]This section was written by Emmett Keeler and John McCall. We are indebted to Phoebus J. Dhrymes for his valuable suggestions and comments.

[2]See [11], [17], [18], and [19].

[3][11].

[4]In most school districts salaries are constant across schools for teachers with identical characteristics. In these circumstances the

connection between turnover and reading ability will be stronger if there are school characteristics, such as a poor plant or location near an airport, that impair both teacher satisfaction and student learning.

Reading ability and teacher turnover should be jointly determined. Here we develop a simultaneous equation model of the relationship and test it on recent data from the San Diego School District. These data come from a file constructed at Rand from information supplied by the San Diego City Schools Personnel Division.[1]

METHODOLOGY

We would like to estimate teacher turnover rates and school reading scores simultaneously, so ordinary least squares (OLS) will not be appropriate. Fundamental to the validity of OLS is the assumption that the independent variables are uncorrelated with the stochastic disturbance, and this assumption is violated whenever the equation being estimated by OLS belongs to a system of simultaneous equations. To obtain consistent estimators of the parameters of a simultaneous equation system, we must replace OLS by a simultaneous equation estimation procedure like two-stage least squares (2SLS).[2]

Let $Y_1$ denote average reading ability at a school and $Y_2$ be the turnover variable ($Y_2 = 1$ if a teacher leaves, $Y_2 = 0$ if the teacher doesn't leave). We might try the following system of simultaneous equations:

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mobility of teachers among schools is best explained by a proxy wage system based on school quality differentials. See [11].

[1]A detailed discussion is presented in Section IV of [11]. This file contains information on each teacher's age, sex, race or ethnic background, number of semester hours completed, and number of years of teaching experience, both within and outside the San Diego school system. It also contains a complete description of the mobility of teachers among the San Diego schools (elementary, junior high, and senior high) between the 1970-1971 and 1971-1972 school years. Schools are listed with such student body characteristics as percentage scoring above the national median on reading, median I.Q., percentage of families on welfare (AFDC) and with a subjective ranking of ease of administration obtained from a panel of school administrators.

[2]Roughly speaking, an estimator is consistent if its probability distribution becomes more concentrated about the true value of the parameter as the sample size increases. For a discussion of two-stage least squares estimation, see [20].

$$Y_1 = \alpha_0 + \alpha_1 Y_2 + \varepsilon_1 \ .$$

$$Y_2 = \beta_0 + \beta_1 Y_1 + \varepsilon_2 \ . \qquad \text{(B.1)}$$

Unfortunately, even 2SLS won't work in this case; the equations are essentially identical.[1] To remedy this, and to control for other influences on reading ability and teacher turnover, we modify the equations by introducing the three exogenous variables: $X_1$, percent of AFDC students; $X_2$, teacher sex (male = 1, female = 0); $X_3$, 1/(number of years teaching in San Diego); and then we apply 2SLS to estimate the $\alpha$s and $\beta$s in the following system:[2]

$$Y_1 = \alpha_0 + \alpha_1 Y_2 + \alpha_2 X_1 + \varepsilon_1$$

$$Y_2 = \beta_0 + \beta_1 Y_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_2 \ . \qquad \text{(B.2)}$$

RESULTS

Table B-1 reports the 2SLS estimates of the $\alpha$s and $\beta$s and also the OLS estimates obtained when each equation in (B.2) is estimated separately by OLS. That was done for elementary schools, junior high schools, and senior high schools. The OLS estimates of $\alpha_2$ and $\beta_1$ are negative and highly significant at all three levels of schooling. In other words, lower SES students have significantly less reading ability, and teacher turnover is negatively related to reading ability of schools.

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[1] This is the "identification" problem. See [20].

[2] The percent of AFDC is a measure of the student input into the school process of students from poor backgrounds. Teacher characteristics are intended to measure the propensity of the teacher to transfer. The functional form for teacher experience, $X_3$, was chosen from data on transfers to preserve the linearity of the model.

We also estimated a three equation system in which subjective ranking was included as a third endogenous variable. However, the 2SLS estimators fluctuated in an incomprehensible manner across the elementary, junior high, and senior high levels.

Table B-1

OLS AND 2SLS ESTIMATES OF TEACHER MOBILITY AND READING SCORES

| | Estimate | Parameter | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | $\alpha_0$ | $\alpha_1$ | $\alpha_2$ | $\beta_0$ | $\beta_1$ | $\beta_2$ | $\beta_3$ |
| Elementary schools | OLS | 49.8 | -.25 | -1.13 | .09 | -.0007 | .044 | .062 |
| | | | (.3)[a] | (65) | | (2.3) | (2.9) | (2.8) |
| | 2SLS | 52.1 | -33 | -1.09 | .11 | -.0011 | .043 | .059 |
| | | | (2.5) | (38) | | (2.9) | (2.9) | (2.7) |
| Junior high schools | OLS | 65.8 | -.35 | -1.68 | .10 | -.0012 | .012 | .081 |
| | | | (.5) | (90) | | (3.5) | (.9) | (2.8) |
| | 2SLS | 67.1 | -41 | -1.57 | .11 | -.0014 | .012 | .077 |
| | | | (2.4) | (28) | | (3.7) | (.9) | (2.7) |
| Senior high schools | OLS | 69.7 | .61 | -2.33 | .06 | -.0008 | .024 | .079 |
| | | | (.6) | (69) | | (2.0) | (1.8) | (2.0) |
| | 2SLS | 70.3 | -20 | -2.28 | .08 | -.0011 | .024 | .074 |
| | | | (1.2) | (38) | | (2.6) | (1.8) | (1.9) |

[a]The numbers in parentheses are the t-statistics.

From the signs of $\beta_2$ and $\beta_3$, we see that inexperienced and male teachers are generally more likely to move.

A new structure emerges from the 2SLS analysis. The estimate of $\alpha_1$ becomes large, negative, and significant. The estimate of $\beta_1$ increases and becomes more significant, but the estimates of $\beta_2$ and $\beta_3$ stay about the same. This suggests that the reason more experienced teachers don't move as much is not just inertia but that they are already at the schools they like. To put the size of $\alpha_1$ and $\alpha_2$ into focus, the worst sixth of San Diego elementary schools (in terms of subjective ranking), have percent of AFDC 30 percent higher than the best and turnover rates approximately 6 percent higher. The reading scores of those groups of schools will differ by (.06 x 33) = 2 points because of teacher turnover and by (1.09 x 30) = 33 points because of student backgrounds. The reading parameter $\beta_1$ accounts for two thirds of the difference in turnover. The analysis suggests that teacher

turnover is a serious problem but that the major reason for the relation between experience and achievement is the ability of experienced teachers to get to the schools of high achievers.

The results obtained, while provocative, are tentative and, of course, pertain only to the San Diego School system. We plan to test the generality of these findings by performing similar analyses of comparable data for school districts in Michigan. We can also see if the same type of phenomenon holds across school districts. Finally, we will attempt to improve our empirical analyses by estimating the simultaneous system using three-stage least squares.

## Appendix C

## INCOME DIFFERENTIALS AMONG TEACHERS

In almost all United States school districts, salary schedules are based solely on job, education, and experience. In these schedules, no distinctions are made between male and female or black and white. However, there were in fact large differentials in median incomes in 1960. How can these differentials be explained? One major reason is the clustering of blacks and women in those teaching jobs that get less pay. Elementary school teachers do not generally get as much training and so make substantially less than secondary school teachers.[1] In addition, blacks have historically been concentrated in the poorer South. White males in general have considerably more education than any of the other three groups. The percent of white male teachers with master's degrees is more than twice that of white women. The returns for further education have not historically been as large for black men as for white, and the difficulties in getting further education have been larger.

A simple model is used to estimate that part of the income differentials of teachers caused by regional, level of school, and education effects. Suppose that the differential between each sex-race group was uniform across each region-level of school-education cell. Then we could use the distribution of sex-race groups shown in Table C-1 to find out what the differential is. The differential between black and white men, for example, would be the difference between the average of the white median incomes in each cell weighted by the percentage of black male teachers in that cell and the black male teacher's median income. If the black-weighted white average was equal to the black

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[1] The NEA first proposed in 1920 that elementary and secondary salaries be figured from a unified schedule. Most districts now follow this policy, so that income differences are now mainly a function of outside work and of salary differentials based on training.

Table C-1

DISTRIBUTION OF U.S. TEACHERS IN 1959 BY REGION, LEVEL OF SCHOOL, AND EDUCATION[a]

| | Education (years of college) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | South | | | | | | Non-South | | | | | |
| | <4 | | 4 | | >4 | | >4 | | 4 | | >4 | |
| | Elem. | Sec. | Elem. | Sec. | Elem. | Sec. | Elem. | Sec. | Elem. | Sec. | Elem. | Sec. |
| Nonwhite males | 1452 | 1122 | 5343 | 6305 | 3078 | 5181 | 523 | 332 | 2098 | 960 | 2722 | 2556 |
| 31,672 | .046 | .035 | .169 | .199 | .097 | .164 | .017 | .010 | .066 | .030 | .086 | .081 |
| Nonwhite females | 10751 | 1913 | 36158 | 9023 | 12758 | 4659 | 3709 | 407 | 11353 | 1391 | 7778 | 2543 |
| 102,443 | .105 | .019 | .353 | .088 | .125 | .045 | .036 | .004 | .111 | .014 | .076 | .025 |
| White males | 4357 | 4713 | 11756 | 20242 | 13078 | 32263 | 13546 | 13873 | 33868 | 57492 | 50463 | 130878 |
| 386,529 | .011 | .012 | .030 | .052 | .034 | .083 | .035 | .036 | .088 | .149 | .131 | .339 |
| White females | 61607 | 7461 | 115112 | 35968 | 40924 | 23002 | 201913 | 17664 | 250533 | 68890 | 113215 | 73458 |
| 1,009,737 | .061 | .007 | .114 | .036 | .041 | .023 | .200 | .017 | .248 | .068 | .112 | .073 |
| Estimated earnings White males $\bar{Y}_M$ = 5862 | 3338 | 4314 | 3972 | 4274 | 5230 | 5692 | 4243 | 5432 | 5097 | 5283 | 6448 | 6954 |
| Estimated earnings White females $\bar{Y}_F$ = 3918 | 2916 | 3189 | 3580 | 3412 | 4614 | 4733 | 3464 | 3974 | 4366 | 4319 | 5540 | 5776 |

[a]The data collection and estimation used in this table were done by Frank Berger. The numbers and salary figures exclude those teachers not considered elementary or secondary.

median value, all the differential would be explained by differences in residence, education, and level of teaching.[1]

As is shown in Table C-2, the black-weighted white male average was 5006, so 60 percent of the black-white difference in 1960 is explained by education, level of school, and especially regional effects. The gap between black and white women is not as large, but it still remains $566 from other factors. Of the $367 difference, 64 percent is explained by education, school, and regional effects, and the remaining $131 is not explained.

Some of the factors affecting race differentials have been narrowing. The major cause is regional (blacks in the South), and southern salaries have been catching up to the rest of the country. For many years, blacks have been steadily moving from the South. The dual southern school system has been closed down over the last five years.[2] It would be interesting to see what effect this has had on the employment of black teachers.

To understand the sex differential, the estimation procedure was applied to white women. Education and level of school effects accounted for 53 percent of the difference from the average white male income, but $772 comes from other factors.

It is not experience that accounts for the sex differential. In [4], the estimated mean experience was seven years for men, 14 years for women. The median age for white women was 44.5, whereas for all other groups it was in the mid-30s. Indeed, the mean salary for men, $4665, was $43 less than the mean salary for women.

How then do white males get the edge? First, although female teachers are slightly better paid than the average female professional,

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[1] In this case, it is not antidiscrimination measures that are needed but migration, higher southern salaries, and incentives for black higher education.

[2] By many measures, southern schools today are less segregated than northern. In 1968, 67 percent of black southern students and 12 percent of black northern students were in all-black schools. By 1971, only 9 percent of black southern students remained in all-black schools, less than the 11 percent of black northern students.

Table C-2

EXPLANATION OF GROUP DIFFERENTIALS BY REGION, SCHOOL, AND EDUCATION EFFECTS

| Group | Yearly Average Income | Yearly Average of White Male Income | Percent of Difference Explained by Regional, Education, and School Effects |
|---|---|---|---|
| White males | 5862 | -- | -- |
| Black males | 4440 | 5006 | 60 |
| White females | 4208 | 4980 | 53 |
| Black females | 3841 | 3972[a] | 64 |

[a]Weighted average of white *female* salaries.

male teachers are considerably lower paid than most other male professionals.[1] To get more money, men have to make extra efforts. They are much less apt to work part-time; in 1960, some 30 percent of male teachers had second jobs in the school system such as coaching and bus-driving, but only 6 percent of women teachers had other jobs. More than half of the male teachers had outside jobs in the summer, but only 8 percent of the women did. Men's extra education, as shown above, gets them more pay as teachers and in addition qualifies them for the higher paying and higher prestige administrative positions. Economic and cultural reasons prevent women from seeking and being given leadership positions--prejudice, disinclination for the type and quantity of work, less need for money, and a higher value placed on time away from work. The number of women in administrative positions is small and declining.

Nonwhites have been better able to become administrators than have women. According to data in [21] the number of nonwhite principals

[1]Social Security data was used to check the spread of teachers' earnings. The distribution is very flat compared with that for professionals as a whole. Indeed, for all sex-race-region categories, the 80th percentile is less than three times the 20th percentile. The region, sex, and race effects noted here are stronger for other professions than they are for teachers.

was about 10 percent of the total, and appointments to other administrative positions have also been increasing.

The Civil Rights Act of 1964 ordered a report within two years on the lack of availability of equal educational opportunity in the United States.[1] Some of the data gathered in the report are useful in estimating salary differentials by race. Table C-3 gives highlights of data pertaining to teacher characteristics and salaries.[2]

The surprising thing about the salaries, as about the other measures of school quality analyzed in the Coleman Report, is that regional and city-rural differences are so much larger than black-white differences. The table shows that black elementary school teachers score higher on experience and on an index of professionality, and lower on the teacher verbal-achievement score. Per-student teacher salaries are lower nationwide for teachers in black schools than for teachers in white schools, but in metropolitan areas this can be explained by regional effects, as over half of the teachers in black schools come from the South, whereas only 20 percent of the teachers in white schools come from the South. The nonmetropolitan schools, and especially black nonmetropolitan schools, had much lower per-pupil salaries than metropolitan schools.

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[1] For a recent reanalysis of the Coleman Report, see [10].

[2] This is from an analysis of the report by David Armor in [10]. Schools were divided into two classes by means of their majority proportions. The problems of overlap are minimized by the fact that 87 percent of the sample schools were more than 80 percent black or white.

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Table C-3

TEACHER CHARACTERISTICS AND SALARIES
(elementary schools)

| Selected Regions | Percent Black Teachers | | Mean Teacher Background Index[a] | | Mean Teacher Verbal Achievement Score | | Mean Annual Per-Student Expenditures on Teachers' Salaries | |
|---|---|---|---|---|---|---|---|---|
| | Black Schools | White Schools | Black Schools | White Schools | Black Schools | White Schools | Black Schools | White Schools |
| South | | | | | | | | |
| Metropolitan | 99 (1945)[b] | 2 (1051) | 3.4 (90)[c] | 2.7 (63) | 19 | 24 | 189 | 182 |
| Nonmetropolitan | 98 (3664) | 4 (2922) | 2.9 (201) | 2.7 (210) | 18 | 23 | 163 | 177 |
| Mid-Atlantic and Great Lakes | | | | | | | | |
| Metropolitan | 32 (2571) | 11 (7844) | 3.0 (108) | 2.8 (338) | 23 | 25 | 256 | 263 |
| Nonmetropolitan | 99 (199) | 4 (1497) | 2.6 (14) | 2.7 (86) | 20 | 25 | 201 | 225 |
| National | | | | | | | | |
| Metropolitan | 62 (5504) | 8 (13455) | 3.3 (251) | 2.9 (607) | 21 | 25 | 224 | 243 |
| Nonmetropoiitan | 93 (4897) | 4 (5935) | 2.8 (243) | 2.7 (480) | 19 | 25 | 186 | 222 |
| National Standard Deviation for Schools | (N.A.) | | 0.6 | 0.6 | (3.6) | (1.7) | 62 | 67 |

[a] One point for each of: Master's degree or higher; major in education or arts and sciences; most undergraduate courses at four-year college; 11 or more hours past highest degree; taught 5-29 years; reading regularly two or more educational journals.

[b] Numbers in parentheses are actual numbers of teachers.

[c] Numbers in parentheses are actual numbers of schools.

# Appendix D
# THE PRIMARY AND SECONDARY EDUCATION FILE[1]

## INTRODUCTION

The Rand Corporation, in connection with its research for the Air Force, the Office of Economic Opportunity, and New York City, has obtained the Social Security Administration's annual one-percent work history files. With support from several sources, Rand's Information Sciences Department has edited and compacted the parent files and has assembled data for the same individuals over time, creating a continuous work history sample of the nation's covered work force. A primary and secondary education subfile, derived from the national file, will be used in support of Rand's research for the Bureau of Educational Personnel Development (BEPD) of the U.S. Office of Education. This appendix will discuss the contents of the subfile and indicate the advantages and limitations of the subfile in terms of BEPD's research needs.

## THE SOCIAL SECURITY WORK HISTORY FILE

Each year since 1957 the Social Security Administration has generated a national one-percent sample of covered wage-earners by selecting the records of individuals possessing certain combinations of digits in their Social Security numbers. Sampling of the same combination of digits year after year has assured continuity of the file--that is, retention of the same individuals in the sample as long as they continue to earn income covered by the system. This also ensures a representative sample over time, since the composition of the sample automatically changes as certain kinds of individuals enter or drop out of the employed labor force.

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[1]This section was written by Stephen Carroll, David Greenberg, and John McCall. Fred Finnegan of Rand's Information Sciences Department has been instrumental in our work with the Social Security file. Without the aid of his knowledge and skills the work described here could not have been accomplished.

Rand has generated two continuous five-year segments for the national sample. The first covers the period 1957 through 1961; the second, 1962 through 1966. The Social Security file is divided into two sections: employee-generated and employer-generated data. The employee's date of birth, race, and sex are obtained from forms filled out when he first applied for a social security number and from correction notices received subsequently by the Social Security Administration. Data on employers are obtained from reports submitted to the Administration by employers. These data include the county from which payments into the system are made by each employer. In most instances this is the county of employment. They also include the employer's identification number, his industry, and his quarterly withholdings, from which the Social Security Administration has made annual estimates of wages. The format of the Social Security file is presented in Table D-1.

Employee Data

The Social Security file contains the individual's scrambled Social Security number. It also contains the individual's sex and date of birth, given by month and year. There are four categories of race: black, white, other, and unknown. The last two categories are minute. Social Security Administration officials believe that most Spanish-Americans have tended to record themselves as white when applying for Social Security numbers. For this reason, one cannot equate black with minority employment.

Employer Data

The data derived from employers' reports are sequenced by year and, within each year, by the (scrambled) employer number. That is, the year is given, say 1957; then all employer-generated data pertaining to that year are listed. The next entry is the subsequent year, 1958 in this example, followed by all employer-generated data for that year, and so on. Within each year the employers are sequenced by their unique employer numbers with all data pertaining to the first employer being given first, then all data for the second employer, and so on for all employers who submitted reports for that person that year.

Table D-1

FORMAT OF THE SOCIAL SECURITY CONTINUOUS WORK HISTORY FILE[a]

- Employee 1
  - Employee Data
    - Employee number (scrambled social security number)
    - Sex
    - Race (black, white, other, or unknown)
    - Month of birth
    - Year of birth
    - Number of years for which employment has been recorded
  - Employer Data
    - First Year
      - Date
      - Number of employers in the year
      - First Employer
        - Employer number (scrambled)
        - State and County
        - Industry (standard industrial classification)
        - Schedule code
        - Coverage code
        - Size of employer (number of employees)
        - Wages
          - Annual reported
          - First quarter reported
          - Second quarter reported
          - Third quarter reported
          - Fourth quarter reported
          - Annual estimated

[a]The same information is recorded for the second and subsequent employers, years, and employees.

Employer Number. The employer number has been scrambled so that identification of the employer is impossible. Yet, like the employee number, it has been scrambled consistently over time. With some limitations, this permits us to determine whether an individual was employed by the same employer throughout a given period.

State and County. The state and county of employment records the location of the office through which reports are made by the employer to the Social Security Administration.

Industry. Code numbers based on the Standard Industrial Classification (SIC) series are used to identify a firm's industry. Primary and secondary education is assigned the unique three-digit code number 821. The industry code reported by an employer is 821 if, and only if, that employer is a primary or secondary school district.

Schedule Code. The schedule code indicates which of the four basic types of reports are filed for the individual: the civilian report, the military report, the farm labor report, or the household report. The code provides only a general occupational breakdown that is of little use for our purposes.

Coverage Code. The coverage code resembles the schedule code. It indicates whether or not a job is always covered by social security. If it is not, the code identifies the job as belonging to one of the categories of jobs that are partially covered: farm labor, state and local government, non-profit organizations, federal civilian agencies, or the military and military reserves.

Size of Employer. The Social Security Administration warns against relying too heavily on employer size. This statistic was obtained by asking each employer, when he initially filled out forms for the Administration, to indicate the number of employees he then had on his payroll. No effort has been made to bring this estimate up to date following the initial report. We believe, however, that this estimate is sufficiently accurate for our purposes.

Wage Income. The file contains two types of wage statistics for each job, annual estimated wages and annual and quarterly reported wages. Reported wages measure taxable earnings and are equal to the total annual (or quarterly) wages of the individual if he has had one

employer and if his reported wages are less than his maximum taxable income.

The Social Security Administration has estimated actual wages and salaries for each job in each year using the following method:

- If reported wages from a job are less than maximum taxable wages in any one year, reported wages are equal to estimated wages.
- For nonfarm employment, the "limit quarter" is that in which maximum taxable income is reached. The reported wages in the limit quarter or the previous quarter are selected, whichever is greater, and used as an estimate of wages in the limit and all succeeding quarters. The annual estimate of wages earned from a job is obtained by summing the actual and estimated wages over the four quarters.

Checks by the Administration's Office of Research and Statistics have indicated that its method of estimating annual income is generally reliable.

Three problems with the wage estimates should be noted. First, part-time and casual employment pose difficulties. For example, it is theoretically impossible to tell whether a person who has reached his maximum taxable income before the end of the year has continued to work or has stopped working. The Administration assumes that he has continued to work for all four quarters, even though he may have died or retired after making his full annual payment into the system. This assumption is more likely to be erroneous for high-wage than for low-wage earners.

Second, multiple employment causes a number of difficulties. No problem arises with a person who reaches his maximum taxable income in one job before the end of the year and who moonlights on other jobs where he does not. His annual income is simply the total of his estimated income from his first job and reported incomes from all other jobs. Income may be overstated, however, for a person who changes jobs during

the year. His estimated annual income is the total of estimated incomes from each of the two jobs. For his estimated income from both jobs to approximate his actual income, he must not have reached his maximum taxable income on the first of the two jobs. If, in fact, a man has changed jobs after reaching his maximum taxable income on the first job, the income from the second job is treated as additional income and is added, improperly, to the estimated annual income from the first job. Again, this difficulty is more likely to occur for upper-income than for lower-income groups.

Finally, the income estimates are wages and salaries from covered employment only. They do not include income of the self-employed or income from investments and transfers, such as pensions and public assistance. Nor do they include wages and salaries paid by employers outside the Social Security system.

## THE PRIMARY AND SECONDARY EDUCATION SUBFILE

The primary and secondary education subfile was created by systematically searching the employer's reports of every individual included in the Social Security file and extracting the work history of every person ever reported as being employed in primary and secondary education. The *entire* work history of every such person was extracted. This is particularly important for three reasons: First, in the cases of professionals who leave education during the 13-year period, the subfile indicates their subsequent employment experiences, if any. Second, for professionals who enter education during the 13-year period, the subfile indicates their previous employment experiences, if any. And third, the subfile indicates professionals' part-time (or moonlighting) and summer employment experiences outside education.

The education subfile retains the employee-generated data in the original format. The employer-generated data, however, was reorganized to ease manipulation of the data in subsequent analyses. The format of the primary and secondary education subfile is presented in Table D-2.

Table D-2

FORMAT OF THE PRIMARY AND SECONDARY EDUCATION SUBFILE[a]

Employee 1

Employee Data

Employee number (scrambled)
Sex
Race (black, white, other, or unknown)
Year of birth

Employer Data

First Quarter

Primary or Secondary School District

District number (scrambled)
State and County
Size of district
Coverage code
Earnings (reported or imputed)

Other Employment

Employer number (scrambled)
Industry (SIC)
State and County
Size of employer
Earnings (reported or imputed)

[a]The same information is recorded for the second and subsequent employers, years, and employees.

Employee Data

With two exceptions the employee data are unchanged from those described earlier. The month of birth and number of years for which employment has been recorded are not useful and are dropped from the file.

Employer Data

The employer-generated data will initially be recorded on a quarterly basis. We are investigating the possibility of aggregating the data to a school-year basis.

For each quarter, the subfile indicates whether the individual is employed by a primary or secondary school district that quarter. If he is, the subfile goes on to indicate that district's employer code number, location, size, and coverage code. It also records the earnings that individual received from the district that quarter. If reported wages from a district are less than taxable wages in any one year, the reported wages for each quarter of that year are equal to the employee's actual wages. If, however, maximum taxable income is reached before the fourth quarter of a year, the employer does not submit earnings reports for that individual in the subsequent quarters of that year. In such cases we rely on the Social Security Administration's estimation technique. That is, the "limit quarter" is that in which maximum taxable income is reached. The reported wages in the limit quarter or the previous quarter are selected, whichever are greater, and used as an estimate of wages in the limit and all succeeding quarters.

The subfile then indicates whether the individual was employed in any area other than primary or secondary education that quarter. If so, the employer's code number, industry, location, and size are indicated. The individual's earnings from non-educational employment are also recorded. In cases where a person works for two or more employers other than a primary or secondary school district, the code number, industry, location, and size of the employer from which his earnings were largest that quarter are recorded. However, all earnings from any source other than a primary or secondary school district are aggregated and reported. Hence the "Other Employment Earnings" datum indicates the individual's earnings from all sources outside education. In those

cases where maximum taxable income is exceeded, we again rely upon the Social Security Administration's estimation technique.

Limitations of the Subfile

The data derived from the Social Security work history file are an extremely rich source of information. They are, however, potentially misleading. The most important problem in using the Social Security data is coverage. Educational professionals are, almost exclusively, exmployees of a state or of a non-profit organization. Social Security coverage is not mandatory for employees in either category. The data are derived from a one-percent random sample of all *covered* educational professionals, and the population weights should be adjusted accordingly.

This problem is somewhat reduced by the fact that some states have made Social Security coverage mandatory at least for educators in elementary and secondary schools.[1] In some 28 states all educational professionals are covered. These states employed 50 percent of all U.S. public elementary school teachers and over 54 percent of all U.S. public secondary school teachers in 1967. (See Table D-3.) Even in those states where coverage is not complete, a high percentage of educational professionals are covered by Social Security. For example, in 1969, 90 percent of all public elementary and secondary school teachers in Montana were included in the Social Security system. Comparable figures for North Dakota and Oklahoma were 88 percent and 92 percent.[2]

We have not, as yet, been able to locate sources that identify the extent of Social Security coverage of educational professionals at the elementary and secondary school levels in the remaining 19 states. The Social Security Administration publishes data on the extent of coverage

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[1] States vary in terms of the extent to which coverage is mandatory. In some states all state employees must join the system; in others only specified categories of employees must join. We need not distinguish between these two circumstances so long as educational professionals at the elementary and secondary school levels are included in the latter category.

[2] [22].

Table D-3

STATES IN WHICH SOCIAL SECURITY COVERAGE OF ELEMENTARY AND SECONDARY PUBLIC SCHOOL PERSONNEL IS COMPLETE[a]

| State | Number of Teachers in 1967 (000) | |
|---|---|---|
| | Elementary | Secondary |
| Alabama | 16.3 | 15.7 |
| Arizona | 12.0 | 4.1 |
| Arkansas | 9.8 | 9.1 |
| Delaware | 2.6 | 2.5 |
| Hawaii | 4.0 | 2.7 |
| Idaho | 3.6 | 3.9 |
| Indiana | 26.3 | 21.5 |
| Iowa | 17.2 | 12.8 |
| Kansas | 14.0 | 10.7 |
| Maryland | 19.4 | 16.7 |
| Michigan | 42.2 | 40.0 |
| Minnesota | 18.4 | 19.3 |
| Mississippi | 11.7 | 9.4 |
| Nebraska | 8.7 | 7.0 |
| New Hampshire | 3.5 | 2.7 |
| New Jersey | 36.3 | 25.8 |
| New York | 82.8 | 78.3 |
| North Carolina | 32.5 | 15.4 |
| Oregon | 12.4 | 9.5 |
| Pennsylvania | 48.1 | 48.8 |
| South Carolina | 13.7 | 11.4 |
| South Dakota | 6.1 | 3.2 |
| Utah | 5.7 | 5.1 |
| Virginia | 23.5 | 18.8 |
| Washington | 16.8 | 14.3 |
| West Virginia | 8.6 | 7.0 |
| Wisconsin | 22.7 | 20.5 |
| Wyoming | 2.2 | 2.1 |

[a]Identification of states in which coverage is complete from [22]. Number of teachers in public elementary and secondary schools from [1].

in education, which includes higher as well as elementary and secondary education. These estimates are provided in Table D-4.

The data displayed in Table D-4 give only the most approximate indication of the extent to which elementary and secondary public school personnel are covered by Social Security. The data have been obtained from different sources and pertain to somewhat different times. Further, the category "education" is very broad and, generally, elementary and secondary public school teachers account for fewer than half the persons included in that category. In fall 1968, there were about 33,000 classroom teachers in Tennessee elementary and secondary public schools,[1] about 43 percent of all persons in public education in that state. The previous March about 55,000 persons in public education in that state were covered by Social Security. It is clear that many Tennessee elementary and secondary public school teachers are covered. In fact, all of them may be covered. It seems likely that nearly all elementary and secondary public school personnel are covered in Georgia, Missouri, and New Mexico. Few, if any, of these personnel are covered in Connecticut, Massachusetts, Ohio, or Rhode Island.

We are actively searching for estimates of the extent of Social Security coverage among elementary and secondary public school personnel in these 19 states. We also intend to generate our own population weights from the data contained in the Social Security file.

A second limitation of the elementary and secondary education subfile is that the data do not identify either the location or the particulars of employment within the district. Thus we cannot identify at which school, on what level, or in what speciality a professional may be teaching. The data will not support analyses of intradistrict personnel flows. Accordingly, in using these data, we are limited to analyses of interdistrict flows and flows into and out of the profession.

Third, we cannot, in general, identify particular school districts. We can use the area (state and county) and size codes to classify districts into broad categories (rural South; large, urban West; and so on). We can also distringuish between central city and suburban

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[1] [23].

Table D-4

STATES IN WHICH SOCIAL SECURITY COVERAGE OF ELEMENTARY AND SECONDARY PUBLIC SCHOOL PERSONNEL MAY NOT BE COMPLETE[a]

| State | Number of Persons in Public Education (000) | |
|---|---|---|
| | Total (Oct. 1968) | Covered (Mar. 1968) |
| Alaska | 6.5 | 3.4 |
| California | 391.0 | 99.3 |
| Colorado | 52.8 | 1.2 |
| Connecticut | 56.6 | 0.4 |
| Florida | 123.2 | 36.3 |
| Georgia | 86.4 | 81.8 |
| Illinois | 193.6 | 49.1 |
| Kentucky | 59.4 | 41.3 |
| Louisiana | 77.5 | 21.9 |
| Maine | 19.5 | 4.3 |
| Massachusetts | 90.5 | 0.0 |
| Missouri | 83.7 | 77.9 |
| Nevada | 9.8 | 0.4 |
| New Mexico | 25.3 | 25.3 |
| Ohio | 188.3 | 1.2 |
| Rhode Island | 15.9 | 1.1 |
| Tennessee | 76.1 | 54.9 |
| Texas | 222.8 | 85.9 |
| Vermont | 9.6 | 7.9 |

[a]Total number of persons in public education, October 1968, from [23], Table 621, p. 432. Covered employed in public education from [24], Table 4, p. 22-23.

districts and, thereby, identify the central city districts. But we cannot identify, for exampl icular suburban districts.[1]

Advantages of the Subfile

The Social Security data file and the primary and secondary education subfile derived from it have a number of attributes not possessed by any other educational data source. One major attribute of the subfile is its sheer physical size. Approximately 65,000 persons in public elementary and secondary education are in the sample. A data base of this size permits analyses of the experiences of narrowly defined population subgroups. The sample can be divided into a number of cells, but a sufficiently large subsample in each cell remains to support statistical analysis.

A second major advantage of the subfile is its longitudinal nature. Up to 10 years of continuous employment experiences is available for people included in the sample. Of course, for those who began work after 1957 or who retired (permanently) or died before 1967, we have fewer years of observations. Even then, however, the data will normally cover each person's experiences over a number of years.

The importance of this aspect of the subfile is emphasized by comparison with the vast majority of data on the educational personnel system that is currently available from other sources. Educational data are generated by a sample survey or census at one point in time. Such data can provide a detailed understanding of the state of the educational system at that time. But these data offer no insight into the progress or movement of the system. Accordingly, they are of limited value for projecting the future consequences of current or past behavior.

Longitudinal data can support analyses of the extent to which, and the ways in which, the current state of the educational personnel system is related to the previous experiences of educational professionals.

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[1] For reasons mentioned earlier, the size code is not sufficiently accurate to distinguish among various districts of roughly equal size. But it can be used to distinguish between the large central city districts and the much smaller suburban district.

These data provide a basis for the development of predictive models of the educational personnel system.

The third major advantage of the Social Security file is that it indicates the employment experiences of educational professionals before their entry into, and subsequent to their exit from, the educational personnel system. The data thus permit identification of the sources of educational personnel. They also can be used to identify what happens to exiting personnel. Most important, these data can be used to support analyses of the economic factors that influence entry and exit.

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